

Activity Title: A Day of Hydro

Subject: NOAA Ocean Careers--Hydrographer

Grade Level: 3-6

Average Learning Time:

- Teaching the lesson & Assessment — one class period

Lesson Summary (Overview/Purpose):

Using portions of a teacher-created book highlighting Teacher at Sea experiences aboard NOAA Ship RAINIER during a 2009 research cruise in the Pavolf Islands, AK, expose students to the NOAA Ocean Career of Hydrographer.

Overall Concept (Big Idea/Essential Question):

Students will understand that hydrography is the process of collecting data about the surface of the ocean floor through the use of technology. NOAA hydrographers survey the ocean floor for the purposes of safe navigation and ocean exploration.

Specific Concepts (Key Concepts):

Upon completion of the lesson, students will understand the definition of hydrography. They will communicate how NOAA uses hydrographic data as an important tool in navigational safety. A hydrographer's job involves many skills including technology, mathematics, physics, and geography. A hydrographer must know how to interpret maps; utilize specialized computer programs; operate and navigate a survey launch; and communicate effectively with others.

Focus Questions (Specific Questions):

1. What is hydrography/hydrographic survey?
2. How does NOAA use hydrography?
3. What does hydrographic data tell us?
4. What are some of the modern technologies used to survey the ocean floor and how do they work?
5. What is a typical day like for a NOAA hydrographer?

Objectives/Learning Goals:

A) Given a set of 11 questions at the end of the lesson, students will be able to identify 9 out of 11 correctly.

1. Identify the definition of hydrography/hydrographic survey as the measurement and description of physical features on the bottom of the sea floor for the primary purpose of navigation.
2. Identify the main way NOAA uses hydrography as a way to identify hazards to safe navigation through the creation and updating of nautical charts.
3. Identify that hydrographic data tells us the depth of water in a surveyed area, including the presence of any natural or human-imposed obstructions.
4. Identify that the data collected in a hydrographic survey is used to create or update nautical charts, which are like road maps for mariners.
5. Identify Multibeam Sonar given its definition.
6. Identify the definition of “polygon” as it relates to hydrography.
7. Identify CTD as “conductivity, temperature, depth”
8. Identify why Alaskan ocean surface water has a lower salinity.
9. Identify “mowing the lawn” as the data collected from the multibeam sonar swath pinging off the ocean floor.
10. Identify what happens in the Plot Room.
11. Identify why bottom samples are important.
12. Identify bathymetry.

B) Communicate which part of a hydrographer’s typical day is most interesting and why.

Background Information:

Teachers can review the following websites to provide further background on the NOAA Ocean Career of hydrographer.

Teacher at Sea: Mrs. Armwood’s Hydrographic Adventure on the NOAA Ship FAIRWEATHER
http://teacheratsea.noaa.gov/books/pdf/tas_book3.pdf

The Surveyors: Charting America’s Course

http://www.nauticalcharts.noaa.gov/staff/education_surveyors.htm

This 27 minute video is a helpful introduction to the topic of hydrography and hydrographic/coastal surveys

NOAA's Office of Coast Survey

<http://www.nauticalcharts.noaa.gov/index.html>

<http://www.nauticalcharts.noaa.gov/staff/education.htm> (Education page)

http://www.nauticalcharts.noaa.gov/staff/education_animations.htm (Multibeam and SideScan Sonar animations)

Common Misconceptions/Preconceptions:

n/a

Materials:

- Computer with Internet connection and SmartBoard or projector connection
- Copy of Stacey Klimkosky's Teacher at Sea book and/or the following online photo albums which show some of the material in the book
- <https://picasaweb.google.com/StaceyKlim/TASJuly611#>
- <https://picasaweb.google.com/StaceyKlim/TASJuly1219#>
- Copy of a NOAA Nautical Chart (paper) if available or see <http://www.nauticalcharts.noaa.gov/mcd/NOAAChartViewer.html>
- Assessment

Technical Requirements:

- Computer or tablet with Internet connection

Teacher Preparation:

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Keywords:

hydrography/hydrographic survey
navigational chart
conductivity
multi-beam sonar
bathymetry

Pre-assessment Strategy/Anticipatory Set:

n/a

Lesson Procedure:

1. Write the word HYDROGRAPHY on the board. Ask for volunteer definitions. Look at the parts of the word. Provide definition as “the measurement and description of physical features on the bottom of the sea floor for the primary purpose of navigation”
2. Explain that a hydrographer is a person whose job it is to collect and analyze this data which is then used to produce or update nautical charts.
3. Read aloud the parts of Stacey Klimkosky’s Teacher at Sea book relevant to “a day of hydro” and/or use slides in the above online slide show links.
 - Deployment of **launches** from **davits**
 - Explanation of **sheets** and **polygons** as they relate to hydrography
 - Explanation of a **CTD**, that CTD stands for **C**onductivity **T**emperature **D**epth, and that casts are made throughout the day (ask students to theorize why casts are made at different times during the day)
 - Explain **Moving Vessel Profiler** (MVP)
 - Define **multibeam sonar**, **swath**, “**mowing the lawn**”, “**holiday**” (show the video to illustrate: http://www.nauticalcharts.noaa.gov/staff/education_animations.htm)
 - Introduce the **plot room**, **data correction and clean up**, **bathymetry**
 - Introduce **bottom samples**. Why would bottom samples be important data to have to create nautical charts?
4. Students complete assessment (see Additional Resources).

Assessment and Evaluation:

Students will complete a 11 question matching and multiple choice assessment at the end of the lesson. (see Additional Resources)

Author: Stacey Klimkosky
Teacher at Sea 2009 aboard NOAA Ship *RAINIER*
Mission: Hydrographic survey in the Pavlof Islands, AK

Creation date: September 2009

Standards:

National Science Education Standards Addressed:

Science as Inquiry Standards:

Abilities necessary to do scientific inquiry; Understanding about scientific inquiry

Physical Science Standards:

Properties of object and materials; Motions and forces

Science and Technology Standards:

Abilities of technological design; Understanding about science and technology

History and Nature of Science Endeavors Standards:

Science as a human endeavor; History of science

Ocean Literacy Principles Addressed:

Principle #6: The ocean and humans are inextricably interconnected.

- b. From the ocean we get foods, medicines, and mineral and energy resources. In addition, it provides jobs, supports our nation's economy, serves as a highway for transportation of goods and people, and plays a role in national security.
- c. The ocean is a source of inspiration, recreation, rejuvenation and discovery. It is also an important element in the heritage of many cultures.
- e. Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (point source, non-point source, and noise pollution) and physical modifications (changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.
- f. Coastal regions are susceptible to natural hazards (tsunamis, hurricanes, cyclones, sea level change, and storm surges).

Principle #7: The ocean is largely unexplored.

- a. The ocean is the last and largest unexplored place on Earth—less than 5% of it has been explored. This is the great frontier for the next generation's explorers and researchers, where they will find great opportunities for inquiry and investigation.

- b. Understanding the ocean is more than a matter of curiosity. Exploration, inquiry and study are required to better understand ocean systems and processes.
- d. New technologies, sensors and tools are expanding our ability to explore the ocean. Ocean scientists are relying more and more on satellites, drifters, buoys, subsea observatories and unmanned submersibles.
- f. Ocean exploration is truly interdisciplinary. It requires close collaboration among biologists, chemists, climatologists, computer programmers, engineers, geologists, meteorologists, and physicists, and new ways of thinking.

Massachusetts State Science & Technology Standards Addressed:

Earth & Space Science Gr. 6-8	<p><u>Mapping the Earth:</u> 1. Recognize, interpret, and be able to create models of the earth's common physical features in various mapping representations, including contour maps.</p> <p><u>Heat Transfer in the Earth:</u> 4. Explain the relationship among the energy provided by the sun, the global patterns of atmospheric movement, and the temperature differences among water, land, and atmosphere.</p> <p><u>Earth's History:</u> 6. Describe and give examples of ways in which the earth's surface is built up and torn down by natural processes, including deposition of sediments, rock formation, erosion, and weathering.</p>
Physical Sciences Gr. 3-5	<p><u>Sound Energy:</u> 11. Recognize that sound is produced by vibrating objects and requires a medium through which to travel. Relate the rate of vibration to the pitch of the sound.</p>
Gr. 6-8	<p><u>Properties of Matter:</u> 2. Differentiate between volume and mass. Define density.</p>
Technology/Engineering Gr. 6-8	<p>6. <u>Transportation Technologies:</u> <i>Central Concept:</i> Transportation technologies are systems and devices that move goods and people from one place to another across or through land, air, water, or space.</p>

Additional Resources:

Copy of "A Day of Hydro" assessment

Name: _____ Date: _____

A DAY OF HYDRO

Using the information that you learned about hydrography and the NOAA Ocean Career of hydrographer, answer the following questions.

Match the following words to their definitions:

hydrography	underwater topography
polygon	mounted under a boat or ship, they use sound waves to find and identify objects in the water and determine water depth
bathymetry	measurement and description of physical features on the bottom of the sea floor for the primary purpose of navigation
multibeam sonar	an area to be surveyed, usually follows the contour of the nearby shoreline

Circle the best answer.

1. NOAA uses hydrography to

- (a) identify hazards for safe navigation
- (b) create and update nautical charts
- (c) make water
- (d) both a and b

2. Nautical charts are like _____ for mariners.

- (a) book reports
- (b) road maps
- (c) web pages
- (d) newspapers

3. Ocean water near the surface has a lower salinity in some Alaskan waters because

- (a) there are no salt fields nearby
- (b) fish eat the salt
- (c) run-off from glaciers dilutes the ocean water
- (d) ocean levels are higher there

4. Collecting data with a multibeam sonar swath pinging off the ocean floor is called

- (a) riding the bull
- (b) drinking the water
- (c) driving the survey launch
- (d) mowing the lawn

5. What happens in the Plot Room aboard the survey ship?

- (a) data is cleaned and processed
- (b) water is boiled
- (c) salt is put back in water
- (d) hydrographers sleep there

6. Why are bottom samples important to hydrographers?

- (a) information is put on nautical charts
- (b) helps boat captains know if it is safe to anchor there
- (c) bottom samples can be sold for money
- (d) both a and b

7. What does hydrographic data tell us?

- (a) depth of water
- (b) if there are any natural obstructions
- (c) if there are any natural obstructions
- (d) all of the above

8. What part of a hydrographer's work day do you find most interesting? Why?
